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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS AND INTERFERENCES**

In re Application of:

Appeal No. 2009-002505

Tae-Sung Kim *et al.*

Serial No.: 10/767,281

Examiner: Matthew E. Warren

Filed: 30 January 2004

Art Unit: 2815

For: NOVEL CONDUCTIVE ELEMENTS FOR THIN FILM TRANSISTORS USED
IN A FLAT PANEL DISPLAY

REQUEST FOR REHEARING

Paper No. 36

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Decision on Appeal dated September 22, 2009, the following request for rehearing and other relief, is respectfully submitted:

Folio: P57002
Date: 11/23/09
I.D.: REB/MDP/kf

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REMARKS

In the Decision on Appeal dated 22 September 2009, several points were made by the Board. Since Appellants believe that points have been misapprehended, or overlooked, or based upon a technically flawed and inaccurate reading of the administrative record by the Board, or based upon a lack of substantial evidence, or upon evidence not found in the administrative record, this Request is respectfully submitted pursuant to 37 C.F.R. §41.52.

The Final Rejections

In the Decision on Appeal, the Board considered the final rejection of claims 1, 2, 4 through 7, 14, 15 and 17 through 19 as rendered obvious under 35 U.S.C. §103(a) over the Examiner's proposed combination of Ohtani U.S. 6,271,543 modified according to Maeda U.S. 5,278,099. (Dec. 3); and the final rejection of claims 8 through 13 and 21 through 24 as rendered obvious under 35 U.S.C. §103(a) over the Examiner's proposed combination of Ohtani U.S. 6,271,543 modified according to both Maeda U.S. 5,278,099 and Yamazaki U.S. 2003/0222575. (Dec. 3).

Aluminum And Aluminum Alloys

On page 9 of the aforesaid Decision on Appeal, the Board quotes the Examiner's statement that if aluminum alloys are not to be used, "Ohtani would have specifically stated that an aluminum alloy cannot be used for the source line and drain electrode."

The Board then states,

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“The Examiner’s response, we conclude, is reasonable and rational, because we indeed found no teaching or suggestion in the Ohtani excluding the use of any aluminum alloy for source or drain electrode structures.”

Appellants strongly disagree. The Board’s stated criterion for obviousness under 35 U.S.C. §103(a) illegally turns upon a determination of whether the Examiner’s proposed combination is expressly prohibited by the primary reference, (*i.e.*, the existence in the administrative record of substantial evidence such as a “teaching or suggestion in the Ohtani excluding the use of any aluminum alloy for source or drain electrode structures.” This is inaccurate.

As a matter of law, the ultimate determination under 35 U.S.C. §103(a) turns upon the existence of sufficient evidence in the administrative record to enable the Examiner to (i) make an identification of the “differences between the subject matter sought to be patented and the prior art” and (ii) to make a determination of whether those differences “are such that the subject matter *as a whole* would have been obvious at the time the invention was made ...,” and does not turn upon whether the Examiner’s proposed combination is expressly prohibited by the primary reference. The fact that the primary reference fails to prohibit, or to teach away from, those “differences” does not serve as evidence-of-fact that the primary reference may be modified by any secondary reference which itself teaches those “differences.”

Moreover, on the facts present in the administrative record, the Examiner’s response was neither reasonable nor rational.

As noted in page 12 of Appellants’ Appeal Brief, Ohtani indicates that either an aluminum

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or an aluminum alloy can be used for gate electrode wiring, while being silent as to whether an aluminum alloy could be used for source and drain electrodes. Ohtani is profoundly devoid of teaching or suggestion that an aluminum alloy could be used for source and drain electrodes.

Appellants submit that if the Examiner's proposed combination was grounded with substantial evidence in the administrative record, Ohtani would either indicate that either an aluminum or an aluminum alloy can be used for both the gate electrode wiring and for the source and drain electrodes or would indicate that aluminum can be used for both the gate electrode wiring and for the source and drain electrodes.

In contradistinction to the "aluminum alloy layer disposed between a pair of titanium layers wherein a diffusion prevention layer is interposed between the aluminum alloy layer and *each of the pair* of titanium layers" as defined by Appellant's claims 1 and 10 however, the Examiner's proposed combination was found by the Board to comprise either a pure aluminum, aluminum silicon, aluminum-titanium-silicon, aluminum-zinc-silicon, aluminum-titanium or aluminum-zinc layer 36 (*see*, Maeda, Figure 1F) separated by a titanium-nitride layer 34 from a titanium layer 32 and an interlayer insulating film 28 taught by Maeda, and used by the Examiner's proposed combination to modify the source wiring line 206 and drain electrode 207 of the primary reference, Ohtani. The primary reference teaches "a three-layer laminated structure of titanium/aluminum/titanium ... [with] the thickness ... made 150/500/150." (*See*, Ohtani, column 7, lines 10-13).

In short, the proposed modification of the primary reference fails to either teach or suggest the formation of Appellant's thin film transistor constructed, *inter alia*, with "a diffusion

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prevention layer is interposed between the aluminum allow layer and *each of the pair* of titanium layers.” Instead, the Examiner’s proposed combination of the teachings of the primary and secondary references, teaches no more than a single “a diffusion prevention layer” because absolutely no “a diffusion prevention layer” or titanium layer may be interposed between the secondary reference’s layer 40 and the secondary reference’s aluminum wiring electrode 36. The complete disclosure of the Examiner’s proposed combination demonstrates that no benefit or advantage is attained by fabricating either “a diffusion prevention layer” or titanium layer may be interposed between the secondary reference’s layer 40 and the secondary reference’s aluminum wiring electrode 36.

Furthermore, the Examiner’s proposed combination fabricated with the teachings of the secondary reference to provide in the primary reference “a diffusion prevention layer” or titanium layer may be interposed between the secondary reference’s layer 40 and the secondary reference’s aluminum wiring electrode 36, would impermissibly prevent the primary reference from being operated in its explicitly defined intended mode of operation where “it is possible to form the second auxiliary capacitance 500 including the drain electrode 207 and the black mask 212 as upper and lower electrodes, and the inorganic laminated film 210 ... as the dielectric.” (See, Ohtani, column 8, lines 52-57).

The Board is respectfully reminded that the creation of this second auxiliary electrode 207 is the *raison d’etre* of Ohtani, as is explained in column 1, lines 19-67 and column 2, lines 1-9. These statements made by the primary reference in justification for its peculiar structure, may not be ignored under 35 U.S.C. §103(a). *United States v. Adams*, 383 U.S. 39 (1966), which rules, on

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other points, that the “interdependent functional relationship” of the inventor must be given consideration.

These differences are required to be identified and considered under 35 U.S.C. §103(a). Appellant respectfully submits therefore, that the Examiner’s proposed combination of the teaching of the primary reference of “a three-layer laminated structure of titanium/aluminum/titanium ... [with] the thickness ... made 150/500/150.” (*See*, Ohtani, column 7, lines 10-13), and the (2) teaching of the secondary reference of pure aluminum, aluminum silicon, aluminum-titanium-silicon, aluminum-zinc-silicon, aluminum-titanium or aluminum-zinc layer 36 (*see*, Maeda, Figure. 1F) separated by a titanium-nitride layer 34 from a titanium layer 32 and an interlayer insulating film 28 taught by Maeda, are, on the administrative record before the Board, just like the facts before the Supreme Court in *United States v. Adams, supra*, teachings found individually in the art, devoid of Appellant’s recognition of the need in the art for a structure with “aluminum alloy layer disposed between a pair of titanium layers wherein a diffusion prevention layer is interposed between the aluminum alloy layer and *each of the pair* of titanium layers” as defined by Appellant’s claims 1 and 10.

In other words, the proposed combination fails to make a *prima facie* showing of the five layer structure using an aluminum alloy as defined by Appellant, and taught in paragraphs [0013] and [0014] of Appellant’s Background discussion, in order to remedy the problems recognized by Appellant, in the art of avoiding the defects concomitant with pure aluminum, prevention of the formation of $TiAl_3$.

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The Board may appreciate therefore, that the Examiner's conclusion of law requires a technically incorrect inconsistency in the language of Ohtani, while the Appellants' conclusion is supported by a lack of inconsistency in the language of Ohtani.

Ohtani's Inconsistent Teachings

Thus, Appellants' assertion that Ohtani teaches away from the modifications proposed by the Examiner is factually correct, and is properly grounded upon the explicit language found in the administrative record. The Board disagreed, citing *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) ("[M]ere disclosure of more than one alternative does not constitute a teaching away . . . because such disclosure does not criticize, discredit, or otherwise discourage [the proposed] solution . . .").

Appellant respectfully submits that this is not a legally correct application of *Fulton*; *Fulton* however, is not the only authority on this issue. *In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994), states, "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant . . . [or] if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant."

Accordingly, we must consider what one of ordinary skill in the art would have been discouraged from making the modifications proposed by the combined teaching of the applied art.

Ohtani discloses an example in which a TFT is manufactured as a switching element disposed in a pixel will be described with reference to FIGS. 2A to 2D starting at line 39 of col.

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4, wherein "an active layer 201 was formed over a substrate (not shown) having an insulating surface. It is appropriate that the active layer 201 is formed of a crystalline semiconductor film (typically a crystalline silicon film) with a thickness of 20 to 100 nm (preferably 25 to 70 nm) (FIG. 2A)."

In lines 47 - 50, Ohtani discloses "**Although any well-known means may be used as a method** of forming the crystalline silicon film, a technique disclosed in Japanese Patent Application Serial No. Hei. 8-335152 was used in this embodiment."

Later Ohtani discloses in lines 59-62, "a film of aluminum or a material mainly containing aluminum (an aluminum film containing scandium of 2 wt % in this embodiment) was formed and was patterned to form a gate wiring line 202 (FIG. 2B)."

Here, we note that Ohtani specifically teaches alternatives that may be used to manufacture the foregoing elements.

When Ohtani discloses the three layered structure of the source wiring line 206 and drain electrode 207 in col. 7, lines 10-13, **no alternatives were suggested**. This is a legally significant omission in the prior art, that may not be ignored. Accordingly, legal minutia such as *In re Fulton*, does not apply to the factual evidence present in the administrative record here because there is no "[M]ere disclosure of more than one alternative," which is a requisite legal threshold requirement. In this regard, instead of the evidentiary factual scenario found in such legal minutia as *In re Fulton*, there is no alternative disclosed among the factual evidence introduced into this administrative record.

In point-of-fact, the Board's reliance upon *In re Fulton* is misplaced. More specifically,

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In re Fulton, 391 F.3d 1195, 73 USPQ2d 1141 (Fed.Cir. 2004) has here, been misconstrued. The Decision of the Board cited *In re Fulton* as an assertion that the disclosure of multiple alternatives in the prior art does not necessarily of itself constitute a teaching away from one of such alternatives comprising the present invention.

Fulton however, does not circumvent the requirement of the Examiner to produce a *prima facie* showing of obviousness. More specifically, the central principle articulated by the court in the *Fulton* decision requires the Examiner, in order to support a finding of obviousness, to show that the prior art specifically and explicitly teaches towards combining the prior art references in such a way as in the present invention. This does not work in the negative, such that the prior art not explicitly teaching away from the combination of the references means that such combination is not explicitly excluded as a possibility, and is therefore taught toward. This is not a valid or warranted legal standard, and in fact is diametrically opposed to the established requirement of a *prima facie* showing of obviousness in the teachings of the prior art references.

The Board is respectfully invited to observe that *Fulton* explains that:

“‘When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references.’ Stated another way, the prior art as a whole must ‘suggest the desirability’ of the combination. ‘Trade-offs often concern what is *feasible*, not what is, on balance, *desirable*. Motivation to combine requires the latter.’ The source of the teaching, suggestion, or motivation may be ‘the nature of the

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problem,' 'the teachings of the pertinent references,' or 'the ordinary knowledge of those skilled in the art.'" (citations omitted)

The art references relied upon here to provide factual support for the Examiner's conclusion of obviousness because those references do not exclude the possibility of the combination of prior art references is not the same as the factual scenario found in *In re Fulton* where the art suggested the desirability of such a combination, as much as teaching or providing motivation to so combine the references. Such teachings are absent from the Examiner's proposed combination.

Consequently, Examiner has failed under *In re Fulton* to meet the *prima facie* burden to show obviousness, and this obligation is not met by an assertion of the negative – i.e. stating that the present invention is an obvious combination of prior art references where the prior art does not explicitly rule out or exclude such a combination.

It should additionally be noted that in *Fulton*, the prior art explicitly discussed *the exact combination* as defined by the claims in question, together with several other alternative combinations. The passage cited by the Examiner thus refers to a situation in which the prior art anticipates and specifically contains the exact combination of references as in the claimed invention, and merely notes that it is immaterial to a showing of the obviousness of such a stated combination whether or not the prior art ultimately evaluates that combination as more preferable than the other stated alternative combinations. The obviousness rejection in *Fulton* is based on the prior art disclosing the specific combination of references (albeit among several such combinations) as comprises the claimed invention.

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The Board is respectfully invited to note that the Court in *Fulton* clarifies the meaning of the cited quotation, explaining that:

“Far from requiring that a disclosed combination be preferred in the prior art in order to be motivating, this court has held that ‘a known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use’...Thus, a finding that the prior art as a whole suggests the desirability of a particular combination need not be supported by a finding that the prior art suggests that the combination claimed by the patent applicant is the preferred, or most desirable, combination.”

And, recognizing that it is well known in the art that pure aluminum has less resistance than an aluminum alloy, especially an alloy utilizing silicon, one of ordinary skill in the art would have been discouraged from modifying Ohtani's three layered structure of the source wiring line 206 and drain electrode 207, since wiring of less resistance, higher conductivity, would have been desired.

Maeda and Increased Contact Resistance

The attention of the Board is respectfully invited to note that Maeda teaches in col. 1, lines 38-49, that **it is well known in the art** that aluminum/silicon alloy would result in an increase in contact resistance, and that in practice, such an increase cannot be ignored.

Accordingly, there is no evidence present in the prosecution history of this administrative

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record which is able to support a conclusion that one of ordinary skill in the art would not have been motivated to modify the aluminum in Ohtani's three layered structure of the source wiring line 206 and drain electrode 207 to constitute an aluminum alloy.

Teaching away is not only based on what the reference teaches, but also on what the skilled artisan would have been known. In the case of Ohtani, the skilled artisan would have known that use of an aluminum alloy instead of pure aluminum would have resulted in an inferior product.

Accordingly, the rejection should not have been sustained.

Considerations of *Graham v. John Deere Co.*

Further, the Board has stated, "The required factual determinations are set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966) (explaining that 35 U.S.C. § 103 leads to three factual inquiries: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; and (3) the level of ordinary skill in the art). Furthermore, the Supreme Court has explained that an obviousness rejection must be based on:

“some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness’. . . [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”

KSR Int'l v. Teleflex, Inc., 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)."

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Appellant respectfully notes that *United States v. Adams*, 383 U.S. 39 (1966) is one application of *Graham*.

Based on the above, Appellant respectfully submits that the Board has failed to consider the entire scope of the prior art present in the administrative record, as well as the level of ordinary skill, when considering the issue of "teaching away."

Selective Reconstruction Of The Prior Art

It is impermissible within the framework of 35 U.S.C. §103(a) to follow the teachings of Appellants' claims and to reconstruct those claims in the light provided by Appellants alone by selectively picking and choosing from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art. *In re Wesslau*, 353 F.2d 238, 241, 147 USPQ 391, 393 (CCPA 1965); see also *In re Mercer*, 515 F.2d 1161, 1165-66, 185 USPQ 774, 778 (CCPA 1975).

The Board has held:

"Based on the record, we conclude that the Examiner has articulated reasoning with rationale for the modification of Ohtani with Maeda teachings to support a prima facie obviousness rejection. For example, the Examiner states that "Maeda recites specific teachings and benefits for using the TiN layer and the Al alloy layer and therefore cures the deficiencies of Ohtani" (Ans. 10). We find that Ohtani discloses a layered active matrix display with sandwiched

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multiple TFTs (FF 2; see also Ans. 3, 4). Ohtani discloses TFTs have titanium/aluminum/titanium layered source and drain electrode structures (Ans. 3, 4; FF 3).

Maeda's Disclosures

Turning to Maeda, the board found that Maeda discloses a manufacturing method for semiconductor devices having source, drain, and gate aluminum electrode structures that are intended to **prevent heat treatment induced diffusion with resulting reaction of the aluminum with adjacent semiconductor material**, and increased electrode contact resistance (FF 5; see also Ans. 4). Maeda further discloses that this electrode structure includes a TiN layer formed between Ti and aluminum alloy layers, where the aluminum alloy layer can be Al-Si (Ans. 4; FF 6).

In order to modify a reference under §103(a), the Supreme Court directs that: "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *KSR*, 550 U. S. at 417. This criterion has not been met by the Examiner's proposed combination because that combination fails to meet Appellants' teaching of:

one of the source electrode and drain electrode comprises an aluminum alloy layer disposed between a pair of titanium layers, wherein a diffusion prevention layer is interposed between the aluminum alloy layer and each of the pair of titanium layers.

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In contradistinction, there is no recognition in the Examiner's proposed combination that there is a problem with the three layered structure of the source wiring line 206 and drain electrode 207 in Ohtani, absent any teaching of subjecting Ohtani's three layered structure of the source wiring line 206 and drain electrode 207 to 450 degrees C, and absent any teaching that further processing of Ohtani's TFT having the three layered structure of the source wiring line 206 and drain electrode 207 would result in Al-Si spikes within the substrate, there is no *prima facie* showing that one of ordinary skill in the art would have been motivated to look to Meada and Yamazaki in order to modify Ohtani. Modification of Ohtani according to Meada and Yamazaki fails to provide any improvement in the operational structure of Ohtani. In short, the only basis disclosed by the art in the administrative record is nothing more than a naked attempt by the Examining staff to resort to Meada and Yamazaki to modify Ohtani in order to make a hindsight reconstruction

The Board also found that,

"Maeda discloses an improved semiconductor device source and drain electrode structure to avert identified deleterious heat treatment effects (FF 5, 6). Appellants have not refuted this record with submitted evidence or persuasive arguments that an ordinarily skilled artisan would be unable to recognize Maeda-identified problems and taught improvements, or that Maeda's electrode structure improvement is beyond such an artisan's skill to utilize. The Supreme Court further directs that: "[u]nder the correct analysis, any . . . problem known in the field of endeavor at the time of

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invention . . . can provide a reason for combining the elements in the manner claimed.” *KSR*, 550 U.S. at 420. Maeda explicitly discloses both knowledge of heat treatment induced electrode problems and an electrode structure to avert these effects (FF 5-7).”

The Board continued by writing that:

“On this record, we conclude the Examiner has provided adequate reasoning with rationale for a § 103 combination of Ohtani and Maeda. We further conclude that Maeda’s teachings **concerning heat treatment** induced problems and a solution provide adequate reasoning with rationale for modification of Ohtani with the Maeda-disclosed electrode structure.”

Appellants respectfully submit that the administrative record fails to provide substantive evidence supporting this conclusion of law. More specifically, looking to Maeda discussion of the prior art in column 1, we find mention of a problem of alloy spikes resulting from **heat treatment** when the wiring layer is heated to a temperature of 450 degrees C.

Looking to Ohtani, we find no discussion of heat treatment of the wiring layers.

Absent a teaching in the Examiner’s proposed combination that there is a problem with the three layered structure of the source wiring line 206 and drain electrode 207 in Ohtani, absent any teaching of subjecting Ohtani’s three layered structure of the source wiring line 206 and drain electrode 207 to 450 degrees C, and absent any teaching that further processing of Ohtani’s TFT having the three layered structure of the source wiring line 206 and drain electrode 207 would

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result in Al-Si spikes within the substrate, there is no *prima facie* showing that one of ordinary skill in the art would have been motivated to look to Meada and Yamazaki in order to modify Ohtani, because there is no indication in the administrative record that either Meada and Yamazaki would, or could, make an improvement in either the structure, functional operation, or attained result provided by the primary reference.

That a prior art device could be modified to produce the claimed device does not justify an obviousness rejection unless the prior art suggested the modification's desirability. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Accordingly, the rejection should not have been sustained.

Application *Graham v. John Deere Co.* To Claims 1, 8, 14 and 21

Graham v. John Deere Co., and the more recent guidance of *KSR Int'l v. Teleflex, Inc.*, require a reasoned statement demonstrating obviousness of the subject matter as a whole, as a threshold requirement to a rejection under 35 U.S.C. §103(a).

Applicants' independent claim 1 calls for *one of the source electrode and drain electrode comprises an aluminum alloy layer disposed between a pair of titanium layers, wherein a diffusion prevention layer is interposed between the aluminum alloy layer and each of the pair of titanium layers*, and independent claims 8, 14 and 21 provide define other definitions.

Ohtani discloses one of the source electrode and drain electrode comprises an aluminum layer disposed between a pair of titanium layers. Neither an aluminum alloy layer, nor a diffusion prevention layer interposed between the aluminum alloy layer and each of the pair of titanium

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layers, is disclosed.

Maeda discloses source and drain wiring layers comprising an aluminum alloy deposited on a diffusion layer and a metal barrier (TiN) deposited on the aluminum alloy layer. There is no diffusion layer interposed between the metal barrier (TiN) and the aluminum alloy layers. Maeda teaches (col. 1, line 65 - col. 2, line 2) that in a conventional method, a barrier metal layer, such as a TiN layer, is formed between the diffusion layer and the Al layer. When the barrier metal is TiN, the boron (B) contained in the diffusion layer diffuses into the TiN layer, making it impossible to obtain good ohmic contact.

Neither of these structures is suggested by Yamazaki's light emitting apparatus, which teaches little more than a drain electrode of a switching TFT 656 connected to the gate electrode of the driving TFT 607 (¶ [0175]).

Accordingly, none of either the Examiner's proposed combination nor any of the applied art, whether taken in various combinations or singularly, teach Appellants' *diffusion prevention layer is interposed between the aluminum alloy layer and each of the pair of titanium layers*. Unexplained in the decision of the Board is how the Examiner's proposed combination may be said to render obvious Appellant's claims 1, 8, 14 and 21 when on the evidence present in the administrative record before the Board, the Examiner's proposed combination fails to provide Appellants' *one of the source electrode and drain electrode comprises an aluminum alloy layer disposed between a pair of titanium layers, wherein a diffusion prevention layer is interposed between the aluminum alloy layer and each of the pair of titanium layers?*

Therefore, in view of the *Graham v. John Deere* test discussed by the Board, the art fails

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to teach Appellants' *diffusion prevention layer is interposed between the aluminum alloy layer and each of the pair of titanium layers* as required by the Appellant's claims.

Accordingly, the Board is respectfully invited to reconsider that these final rejections should not have been sustained. Such action is respectfully urged.

In view of the above, a request for rehearing by the Board is respectfully requested.

Respectfully submitted,


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Folio: P57002
Date: 11/23/09
I.D.: REB/HMZ/MDP